



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN
Ufficio federale dell'energia UFE
Swiss Federal Office of Energy SFOE

Gasification of Biomass and Waste Country Report Switzerland



Martin Rügsegger, *ETECA GmbH*, CH-3617 Fahrni

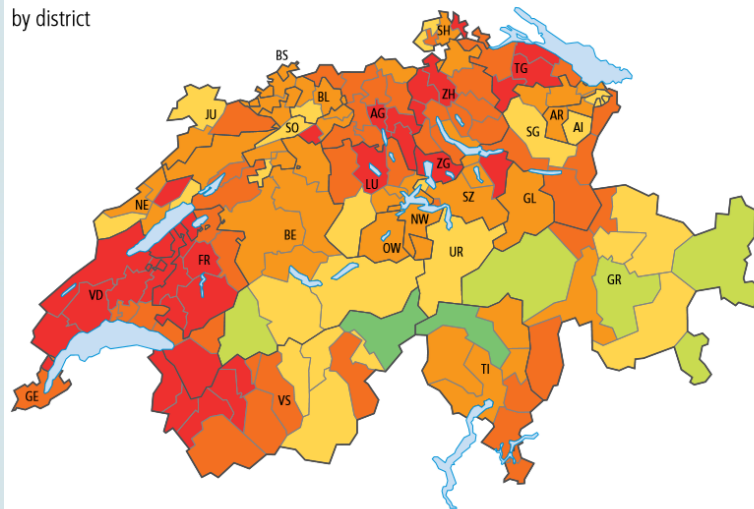
IEA Bioenergy, Task 33, May 2018, Petten



Permanent resident population		2015			
At year-end	Total in '000	Foreigners in %	Urban in %	Density km ²	Population growth 2010–2015 in %
Switzerland	8 327.1	24.6	84.5	208.2	5.8

Population growth, 2010–2015

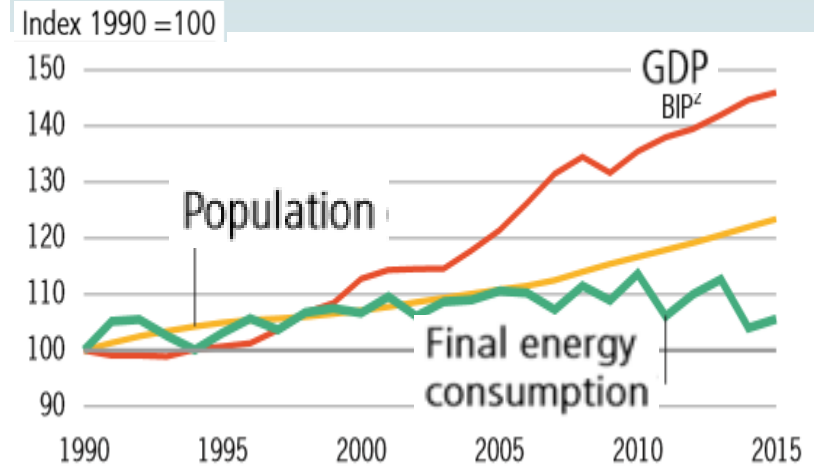
by district



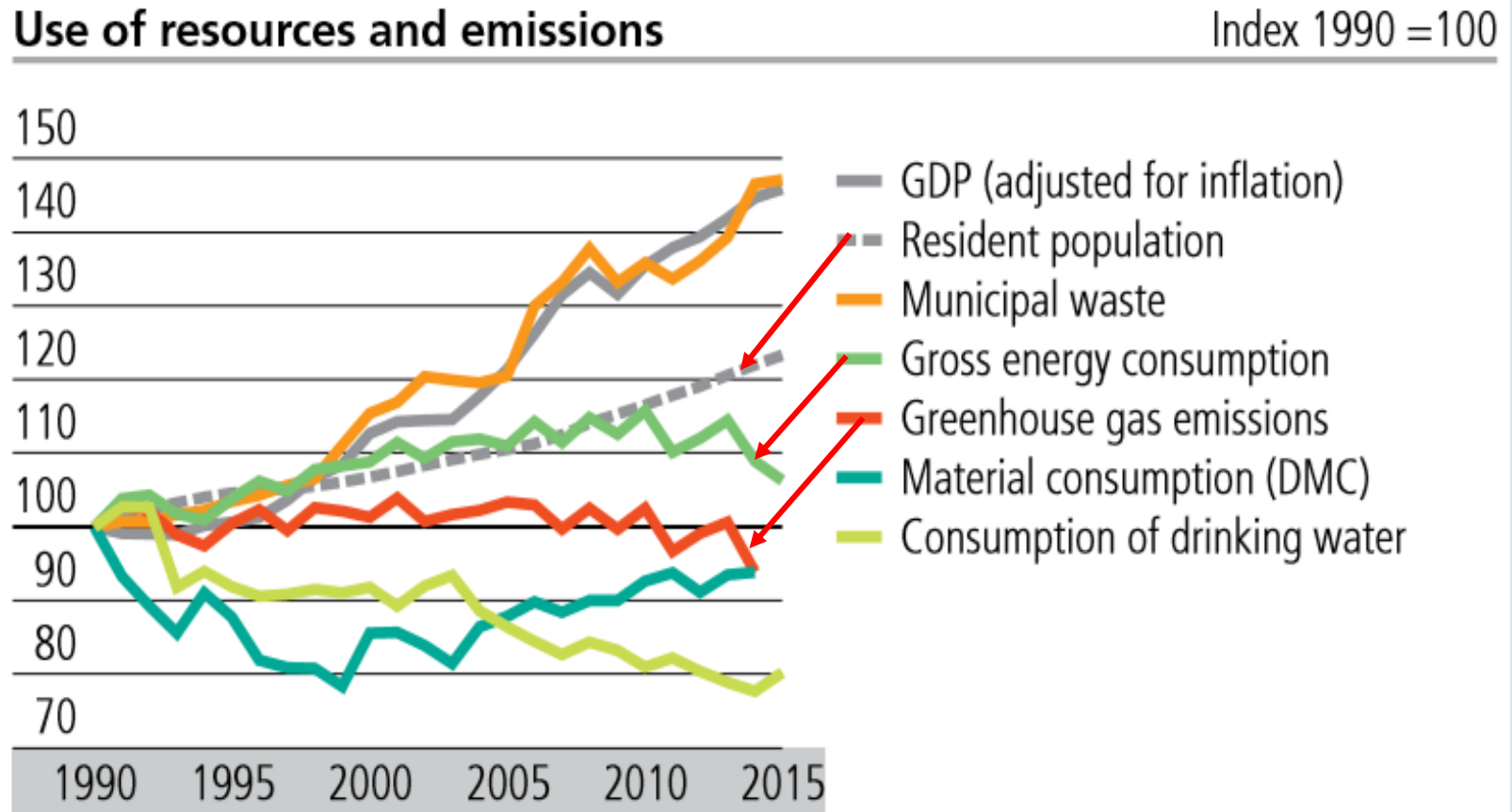
Changes of the permanent resident population, in %

CH: +5.8

≤ -2.5	-2.4 – -0.9	0.0 – 2.4	2.5 – 4.9	5.0 – 7.4	≥ 7.5
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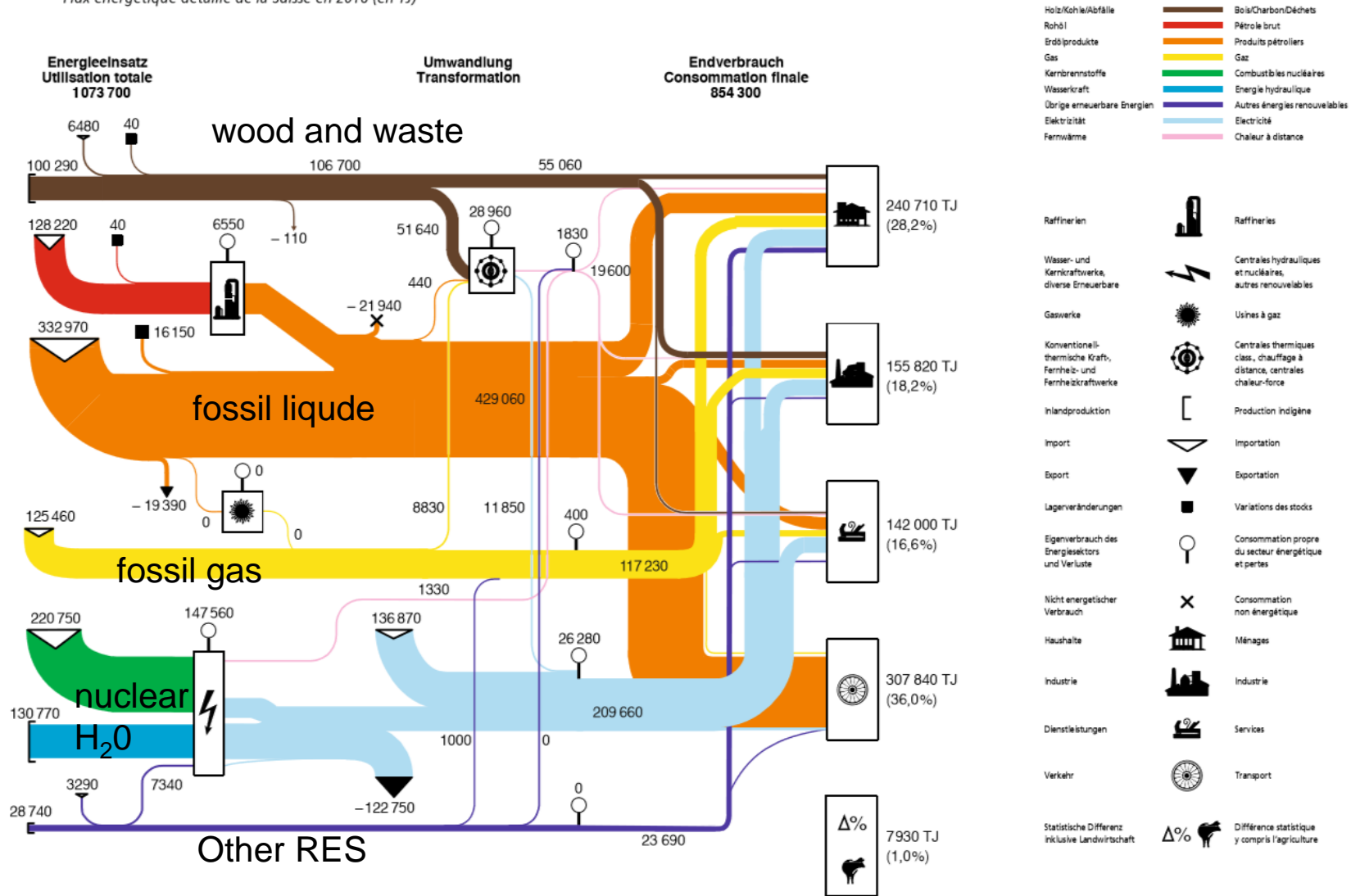
www.bfs.admin.ch/bfs/de/home/statistiken



www.bfs.admin.ch/bfs/de/home/statistiken



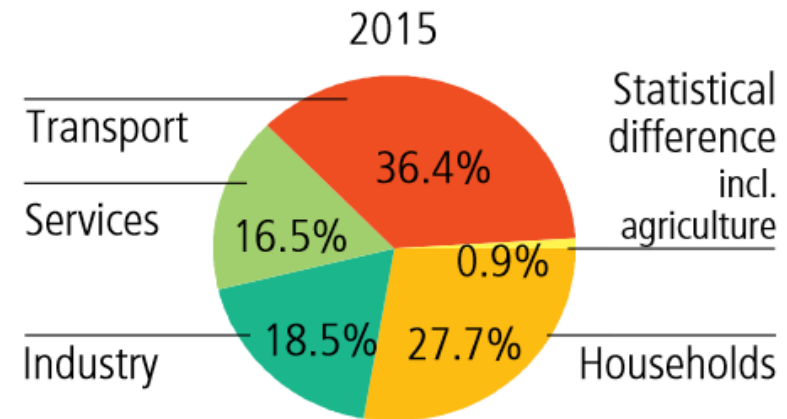
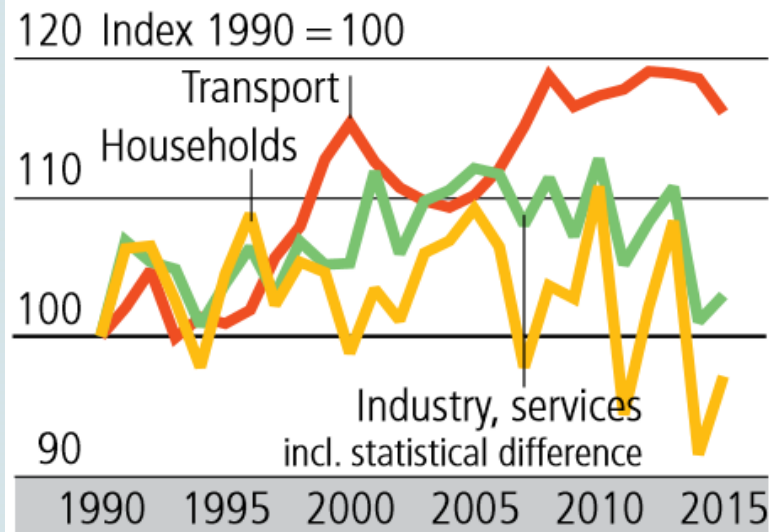
Fig. 5 Detailliertes Energieflussdiagramm der Schweiz 2016 (in TJ)
Flux énergétique détaillé de la Suisse en 2016 (en TJ)



Overall energy statistics
back For more documents please refer to our publistat.bfe.ch
Schweizerische Gesamtenergiestatistik 2016
Institution: BFE
Autor: BFE
Editor: BFE
Publication date: 11.07.2017



Final energy consumption by consumer groups 2015 ≈ 233 TWh Total



- ▶ www.statistics.admin.ch → Look for statistics → Energy
- ▶ www.bfe.admin.ch (Federal Office of Energy) → Topics → Energy Statistics

www.bfe.admin.ch/bfe/de/home/statistiken



Switzerland Renewable Energy Statistics

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In 2 years + 10%

Renewable energy, 2013 ≈ 49 TWh	
Share of final consumption	in %
Total	21.12
Hydropower	12.74
Solar power	0.43
Ambient heat	1.52
Biomass (wood and biogas)	4.80
Wind power	0.03
Renewable energy from waste	1.28
Energy from sewage treatment plants	0.21
Biogenic fuels	0.10

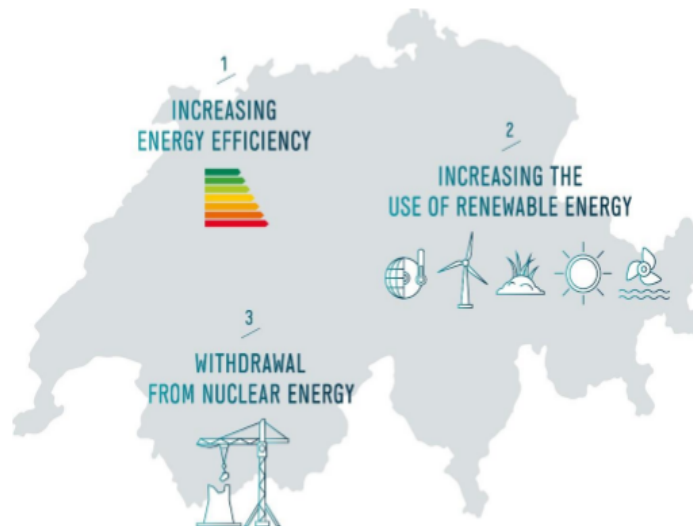
Renewable energy, 2015 ≈ 54 TWh	
Share of final consumption	in %
Total	22.96
Hydropower	13.78
Solar power	0.73
Ambient heat	1.72
Biomass (wood and biogas)	4.71
Wind power	0.04
Renewable energy from waste	1.42
Energy from sewage treatment plants	0.21
Biogenic fuels	0.35

www.bfs.admin.ch/bfs/de/home/statistiken



Energy Strategy 2050 of Switzerland, Entry in to force since 1. January 2018

THREE STRATEGIC OBJECTIVES



Measures to increase energy efficiency

- Buildings
- Mobility
- Industry
- Appliances

Measures to increase the use of renewable energy

- Promotion
- Improvement of legal framework

Withdrawal from nuclear energy

- No new general licences
- Step-by-step withdrawal – safety as sole criterion

SWISS FEDERAL OFFICE OF ENERGY ▪ MEDIA AND POLITICAL AFFAIRS DIVISION ▪ 1 FEBRUARY 2017

http://www.bfe.admin.ch/energiestrategie2050/index.html?lang=de&dossier_id=06702



Research for Biomass Energy Conversion related in within SCCER Biosweet

<http://www.sccer-biosweet.ch/>



News & Events

Industry

Research ▾

Biogas

Biomethane

Heat & Power

Liquid Biofuels

Scenario & Modelling

Category: Research Highlights



ESI Platform – new pathways to
the energy system of the future



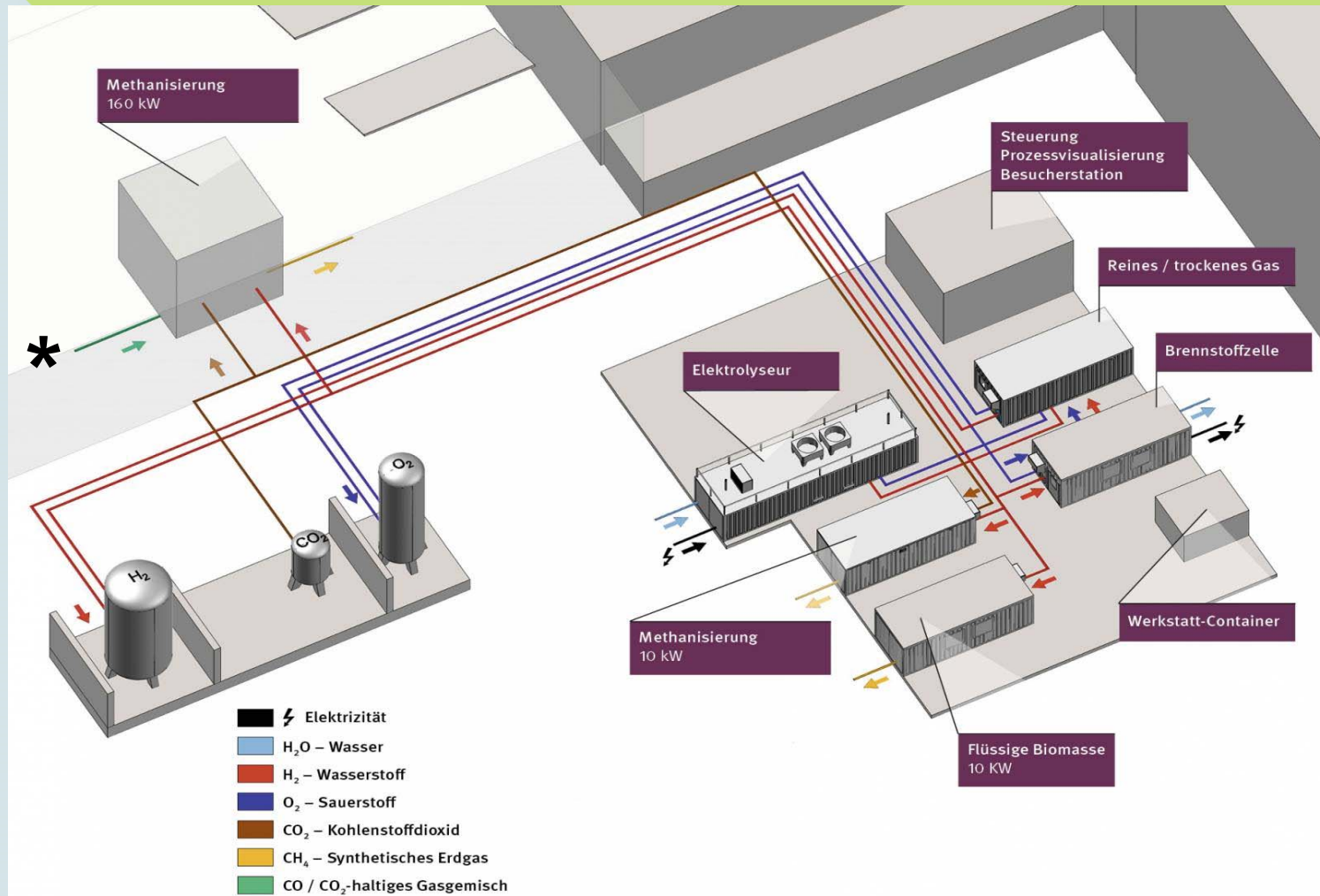
A new approach: Manure-to-
Electricity at small-scale farms



Biomass Torrefaction by the
HEIG-VD / Granit Technologies SA



Research: ESI Plattform at PSI <https://www.psi.ch/psiforum/energy-research-labs> uses also synthetic producer gas (* like from thermal gasifier)





Research on Gasification of Biomass and Waste (no ongoing projects) In the past activities reported by

PSI

www.psi.ch

- Gasification of dry biomass (wood, grass)
 - Co-firing in NGCC for power generation
 - High & low temperature fuel cells for CHP
 - Gas processing for SNG production
 - Dr. Serge Biollaz
- Gasification of wet biomass (hydrothermal gasification of manure, algae)
 - For SNG production
 - Dr. Frédéric Vogel
- EU Infrastructure Project, collaboration with: BRISK
(Biofuels Research Infrastructure for Sharing Knowledge)

<http://www.briskeu.com/>



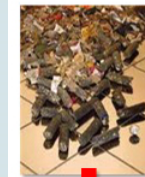
Thermal Gasification of Biomass and Waste Swiss Industries Privat Gasifier Pilot Plant for BM and W

- PROCONE aiming for conversion of BM generally and MS-Wast-Water-Sludge www.procone.ch



IGCC – Combined cycle plants

Possible plant concept, showing the use of IGCC for power and steam production



2 x Feedstock

- RDF: 2 x 3'125 kg/h
- Bunkering: 2 x 60 m³
- Conveying: 2 x 15 m³/h
- Feeding: 2 x 15 m³/h



2 x Gasification

- G-Type: 2 x 3'125 kg/h
- RawGas: 2 x 12'000 Nm³/h
- Slag (ash): < 1'800 kg/h



2 x Gas Cleaning

- Quentsh-Washer
- Venturi-Washer
- SynGas: 2 x 12'000 Nm³/h

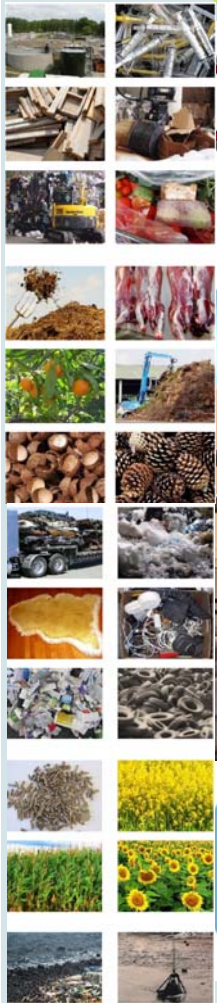


4 x Gas utilization

- 3 x Low-BTU-Gas Turbine
Power 4 x 1'800 kWel.
- 1 x Combined Steam Turbine
Power 1 x 4'800 kWel.



Thermal Gasification of Biomass and Waste Swiss Industries Privat Gasifier Pilot Plant for BM and W



CLEANCARBONCONVERSION GROUP

Ultra-High-Temperature-Hydrolysis
UHTH®



Energy recovery from waste and biomass in the form of syngas
Syngas production from carbonaceous matter

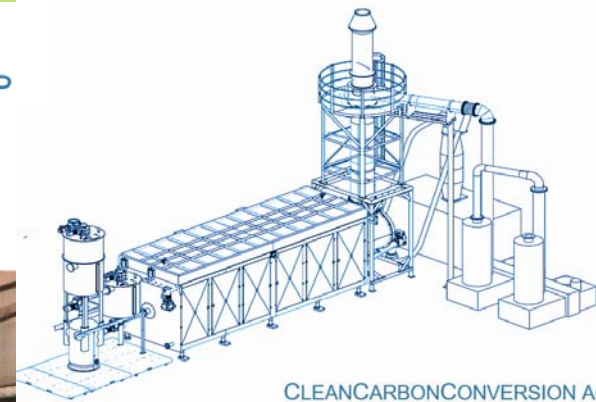


UHTH®
Simple, clean,
sophisticated

- No smoke, no ash nor toxic residues
- Full carbon conversion
- Simple gas cleaning
- Highest possible energy recovery
- Inexpensive
- Efficient & ecologic



www.cleancarbonconversion.com



CLEANCARBONCONVERSION AG
Eichenstraße 11
8808 Pfäffikon (SZ)
Switzerland

In Switzerland

There are two UHTH® unit sizes available:

- T5 handles up to 1.600 tons per year*
- T25 handles up to 8.000 tons per year*

In Croatia



- BR Engineering GmbH CH-6006 Luzern www.br-engineering.ch
 - Engineering and commissioning of thermal Gasification plants and gasification components (Holzstrom Stans)
 - Development of new Gasifier



- XyloPower AG www.xylopower.com
 - Supplier for turnkey biomass gasifier plants (BMG Technique similar to WILA)





- CleanCarbonConversion AG www.cleancarbonconversion.com
 - Supplier for turnkey gasifier plants



- Procone GmbH www.procone.ch
 - Supplier for turnkey gasifier plants





- CTU <http://www.ctu.ch>
 - Supplier for turnkey biomass gasifier plants, gas cleaning....

UMWELT & ENERGIETECHNIK
WASTE TO ENERGY



- SWISS COMBI



- Supplier components dryer etc..



Swiss Industries 2018

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Belt Dryer for Finnlands Valmet gasifier!

HOME DRYERS PILOT-DRYER COMPONENTS SERVICE APPLICATION FIELD ABOUT US LINKS & DOWNLOADS

Our Products - Your drying plants

SWISS COMBI
Experienced. Innovative. Reliable

Metso hat von Vaskiluodon Voima Oy in Vaasa, Finnland,



SWISS COMBI W. Kunz dryTec AG Taubenlochweg 1 CH-5606 Dintikon +41 56 616 60 30

HOME DRYERS PILOT-DRYER COMPONENTS SERVICE APPLICATION FIELD ABOUT US LINKS & DOWNLOADS

Location and Address

SWISS COMBI
W. Kunz dryTec AG

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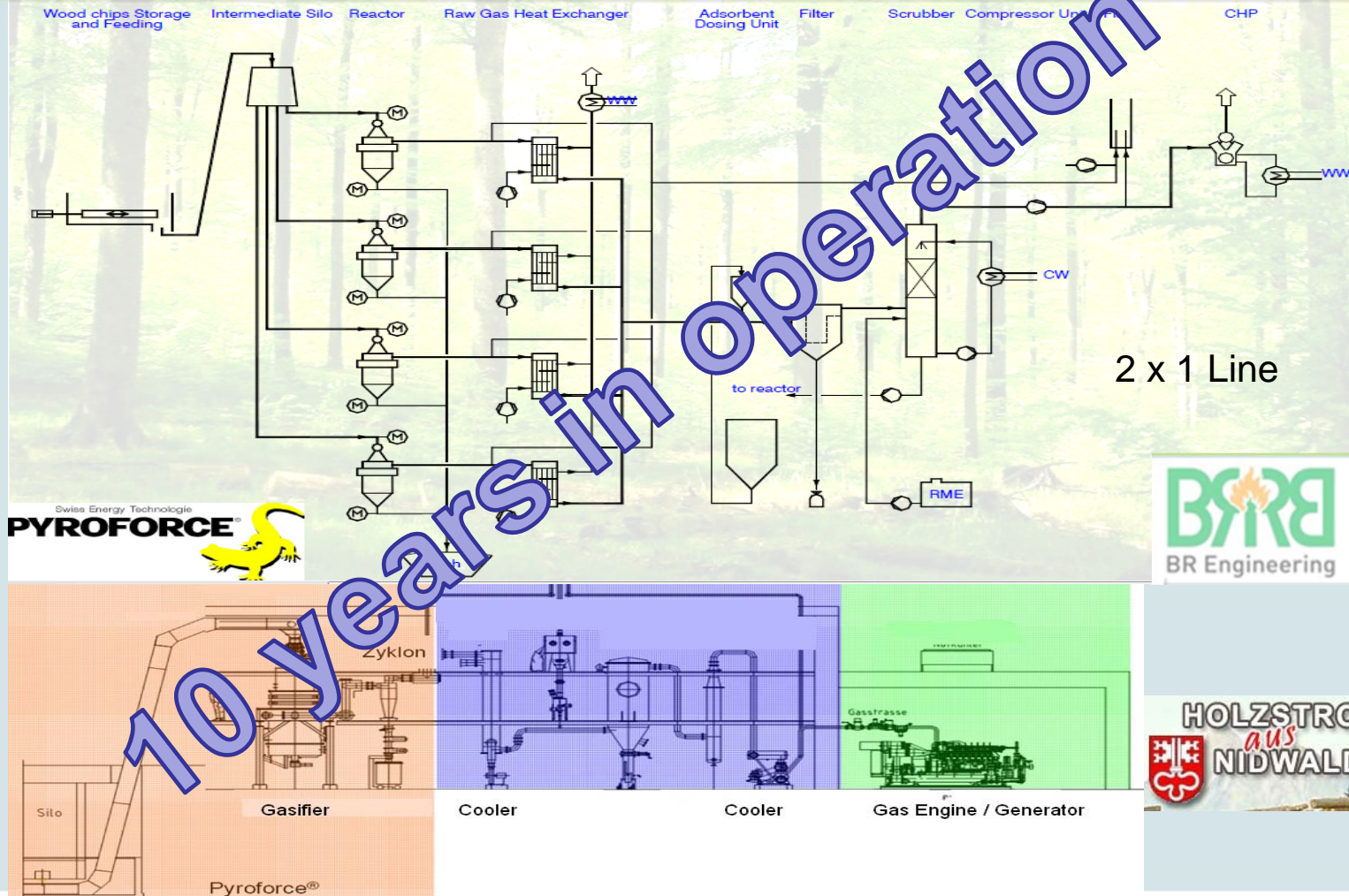
Stans Nidwalden 1 400 kW el. Thermal Biomass Gasification CHP-Plant

1





Stans Nidwalden 2 Lines Total = 1 400 kW el. 2 Thermal Biomass Gasification CHP-Plant





Ettiswil Luzern Switzerland 45 kW el. Thermal Biomass Gasification CHP-Unit «Spanner»



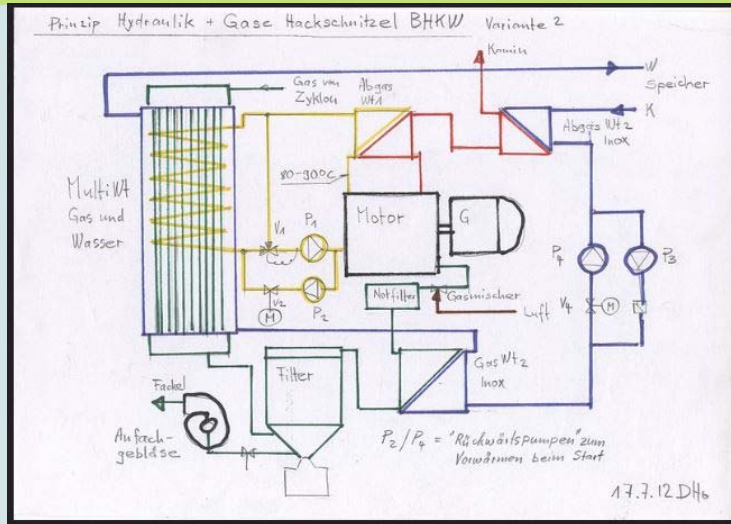
A. STEINER + CIE AG
SÄGEWERK RIEDBRUGG
6218 ETTISWIL



5 years in operation



Hofstetter Self Made-Unit 9 kW el. Thermal Biomass Gasification CHP-Unit



2009 start with experimental gasifier

2013/14 start with CHP 9kW 500h

2014/15 operated during heating season aprox.: 1000h

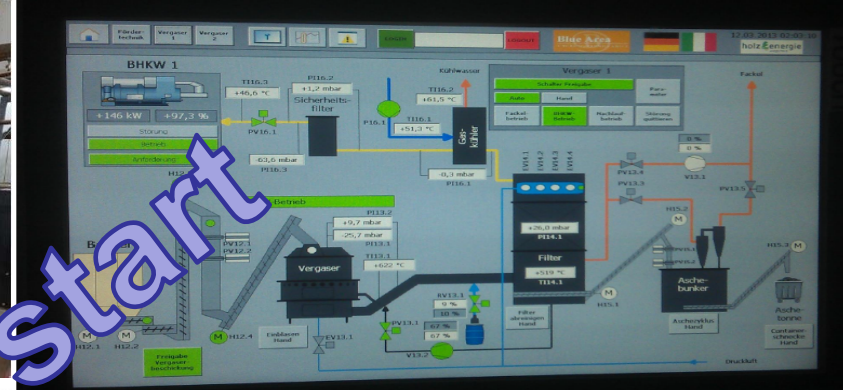
Investment 25 000.- Euro + 2,5 man-year
Legal approved unit by all authorities
receiving KEV (feed in tariff)



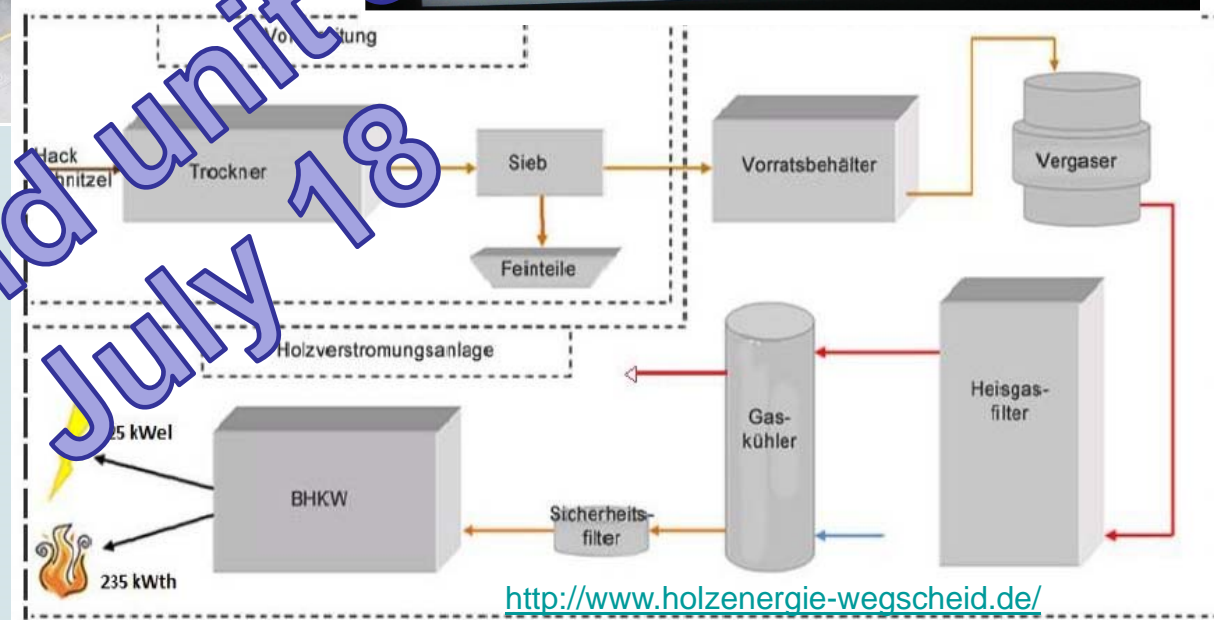


Escholzmatt Luzern Switzerland 125 kW el. Thermal Biomass Gasification CHP-Plant «Wegscheid»

1



Second unit start
July 18

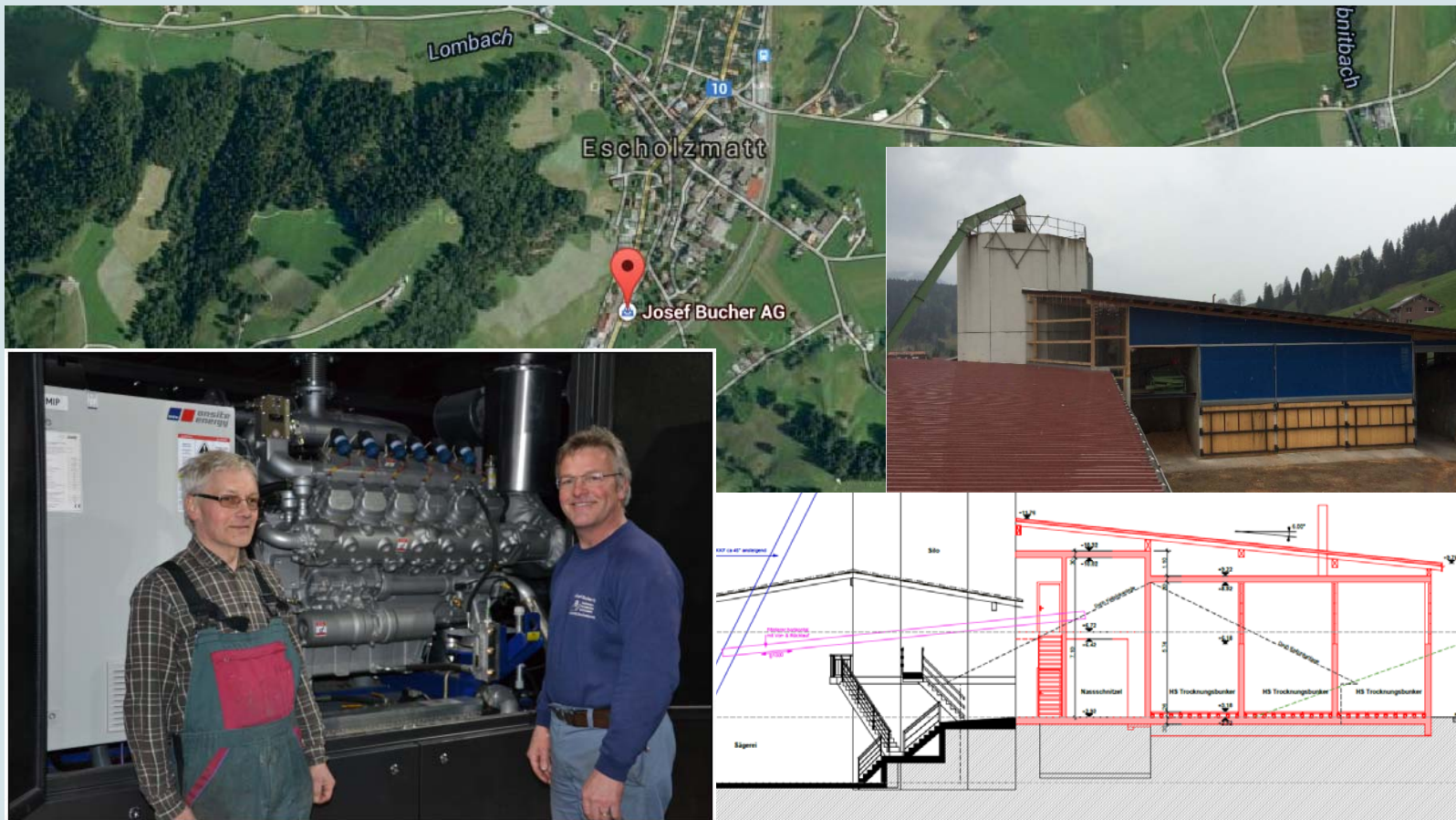




Escholzmatt Luzern Switzerland 125 kW el. Thermal Biomass Gasification CHP-Plant «Wegscheid»

2

Wegscheid Gasifier CHP 425- 133 kW is added to a 2.1 MW district heating System



M. Rügsegger *ETECA GmbH*; CH-3617 Fahrni
IEA Bioenergy: Task 33 Gasification of Biomass and Waste

Petten Netherland, May 2018

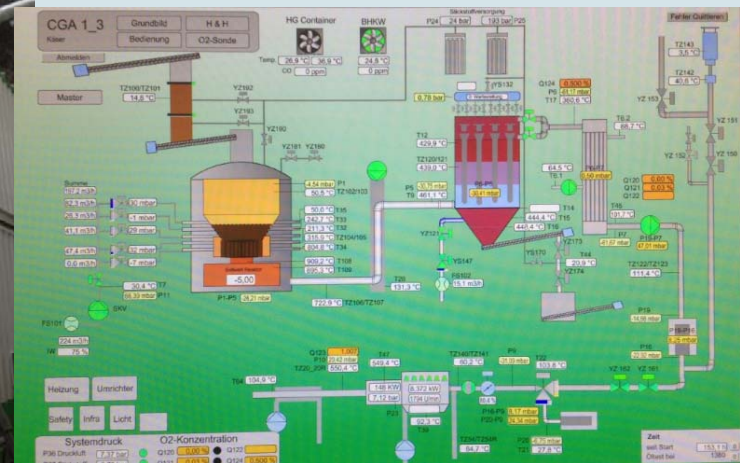


H.H. Käser GmbH, Gasel Köniz, 2 x 140 kW el. Thermal Biomass Gasification CHP-Unit

Chip Wood Supplier for biomass district heating
around Bern.

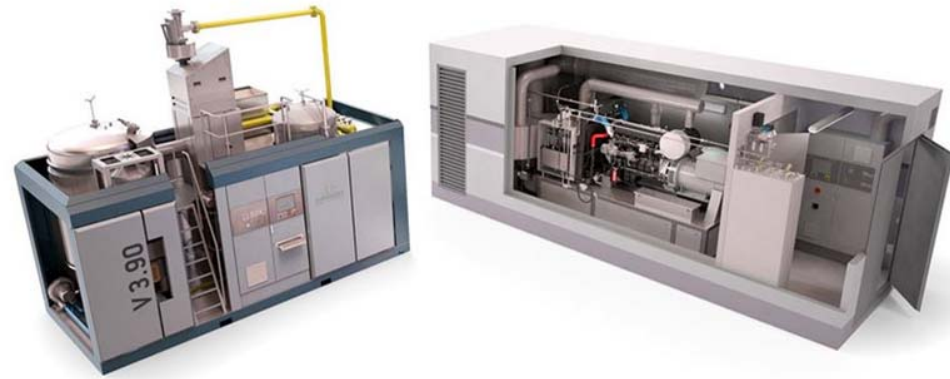
2 Gasifier CHP Unit “Ligento” serves for
electric power and heat for chip wood drying.

www.hhkaeser.ch





AEW Rheinfelden 165 kW el. Start up 2018 Thermal Biomass Gasification CHP-Unit for Wood Pellet's



- www.aew.ch/home.html
- <http://burkhardt-energy.com/hp538/Technik.htm>
- <http://www.rheinfelden.ch/de/>



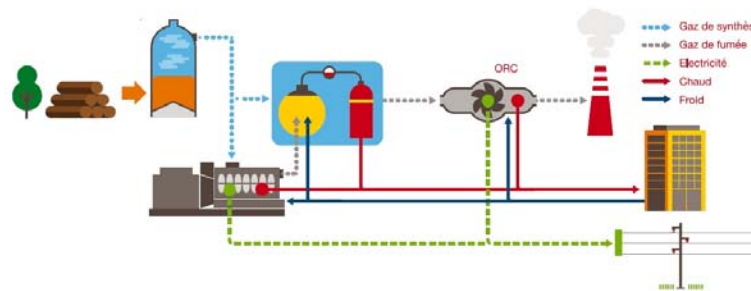
Puidoux Romande Energie start production 4.1.2018 Thermal Biomass Gasification CHP-Unit 890 kWel

- www.regawatt.de
- <http://www.regawatt.de/schweizer-energieversorger->
- <http://www.sonnewindwaerme.de/bioenergie/schweiz>



COGENERATION VIA LA GAZEIFICATION DU BOIS

Puidoux





Thermal Biomass Gasification CHP-Facilities in Switzerland Mai 2018

Summary 1

	AEW Rheinfelden	Käser Gasel I+II	J. Bucher AG Escholzmatt	A. Steiner + Cie. AG	Holzstrom in Stans I+II
Gasifier	Burkhard	Ligento	Wegscheid	Spanner	8 Pyroforce BR modified
Type	downdraft	downdraft	downdraft	downdraft	2-zone downdraft
Gas engine	165 kW	1 x 140 kW	125 kW	45 kW el	2 x 690 kW Jennbacher
Waste heat therm	district heating	for drying	district heating drying wood chips	district heating	1,2 MW for district heating
extra BM-Boiler	yes	no	Yes	yes	1,6 MW W'chips + 1,7 MW oil for district heating
In operation since	January 2018	I = End 2015 II = Spring 2016	1.4.2015	2012/2013	2007



Thermal Biomass Gasification CHP-Facilities in Switzerland Mai 2018

Summary

2

	AEW Rheinfelden	Käser Gasel I+II	J. Bucher AG Escholzmatt	A. Steiner + Cie. AG	Holzstrom in Stans I+II
Fuel	Pellets	Dry clean wood chips	Dry waste wood chips G 30-100	Dry waste wood chips	Dry demolition wood/scrap wood chips
Moisture	<10%	<10%	<10%	Max 15%	10%
Operating hours last 7 months	2'492	Block 1: 3'677 Block 2: 3'680	4'825	3'949	Block 1: 3'555 Block 2: 3'489
Total live time operation h	2'492	Block 1: 11 266 Block 2: 9 886	25'165	29 343	Block 1: 54'349 Block 2: 58'053
Remarks	2 Units in normal operation	2 Units in normal operation	Plant in normal operation	Plant in normal operation	2 unit in normal operation

**8 CHP gasifier Lines in stable operation
2 CHP in construction**

Total 190'554 h operation



Thermal Gasification of Biomass Commercial Swiss Projects Mai 2017

- Gasifier 130 kWel, CHP second unit
Bucher Eschholzmat, July 2018 in operation
- Gasifier Charmay approx 1 MWel 2018/2019 start up
- Gasifier 220 kW Riggisberg CHP, 1 Xylogas unit
unit for forest waste chip => building permission pending
- Privat program is discussed for 20 Gasifier
“start investment aid” 1000.-CHF /1kWel in central Switzerland
- Several small scale gasifier CHP offered from differend
supplier

*Government KEV (Feed in tariff) approx. 28 Eurocent per kWh has been replaced
2018 by Investment contribution approx. 1000.-CHF/kW*



Thanks for your attention!
Any questions?

